

## ABSTRACT

An apparatus and method to detect abnormal combustion conditions for use as a feedback control of an EGR (Exhaust Gas Recirculation) controlled reciprocating engine using ionization signals is presented. The system receives a succession of ionization signals for successive cycles of a running engine and processes a plurality of related ionization signals for signal stability. The ionization signals are checked to determine if an abnormal combustion condition such as knock or misfire has occurred. The variation of an ionization signal that changes with respect to an engine parameter over a combustion event of the reciprocating engine is measured and a floating bounded space is associated with the ionization signal. An indication that the abnormal combustion condition has been detected is provided if a portion of the ionization signal is within the floating bounded space.